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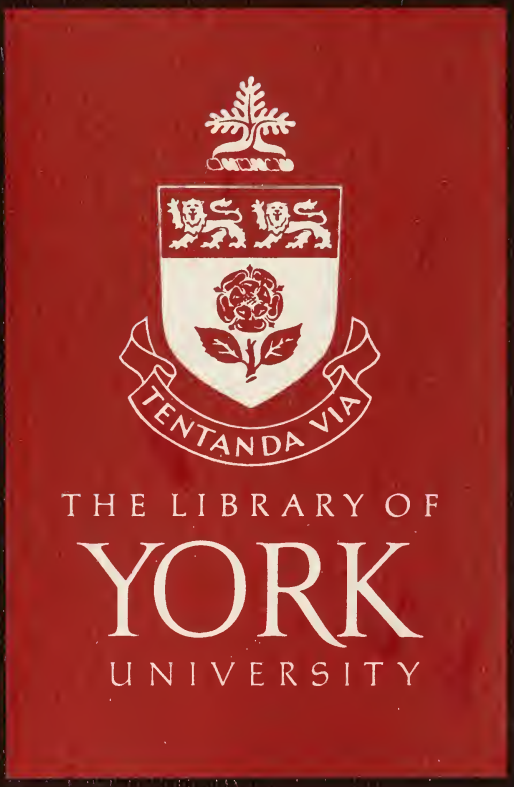
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TORONTO
1931

THE BIOLOGICAL BOARD OF CANADA
UNDER THE CONTROL OF
THE HON. E. N. RHODES
Minister of Fisheries

# BULLETIN No. XIX

## METHODS OF HANDLING FISH

# II. INSTRUCTIONS IN CURING AND PACKING PICKLED MACKEREL

FISHERIES EXPERIMENTAL STATION
HALIFAX, N.S.

TORONTO
1931

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## INTRODUCTION

This bulletin gives directions for the preparation of the best quality of pickled mackerel.

The information necessary for the preparation of these directions has been obtained from men in the fishing industry and the bulletin has been submitted to several firms for their criticism. It has been put together by Dr. H. R. Chipman of the Fisheries Experimental Station staff, with the assistance of Mr. Robert Gray, Supervisor of Fisheries, Halifax, N.S. The bulletin contains directions for the construction and use of a simple, inexpensive salinometer for reading the strength of brine. The illustrations of fish used in this bulletin were made by Miss M. G. Allan.

J. J. Cowie,
*Secretary, Biological Board.*

March, 1931

## CONTENTS


| | PAGE |
|---|---|
| Condition of fish | 5 |
| Splitting | 7 |
| Gutting | 7 |
| Scraping | 9 |
| Washing | 9 |
| Curing | 9 |
| Packing | 11 |
| A simple salinometer | 14 |

## CONDITION OF FISH

In the preparation of any foodstuff it must be remembered that no amount of care in the handling can turn poor material into good. It is even more important to keep this in mind in the case of fish, on account of the ease with which the fish may be damaged or spoiled. Fish spoilage is due to two causes, one is the bacteria which will get into the fish when it is damaged or carelessly handled, the other is the changes which take place in the flesh of the fish immediately after death and which proceed at a rapid rate. If the fish is not carefully handled and looked after prior to being cured, it is impossible to get the highest class product, no matter how much care is afterwards taken with the curing. If a little thought is given to the matter, it is possible for anyone who has had experience in mackerel-curing to prepare pickled mackerel of the very best quality, which should bring the highest prices. On the other hand, carelessness will surely result in a poor product, which will not only be difficult to sell, but will tend to give the packer a bad reputation which may be difficult to overcome. It should not be necessary to point out that when a packer has established a good reputation, it must be maintained.

When set gill-nets are used for catching mackerel, any fish caught should be taken from them at least once every day. It sometimes happens, however, that owing to weather conditions or other causes, set nets cannot be fished every day. **The result in such a case is that a proportion of the catch will have remained dead in the nets for two or more days. Such fish are in bad condition before they leave the water, and no amount of ordinary care in curing will make them firm and white as they should be. Fishermen should, therefore, give particular attention to seeing that when this occurs the soft or "drowned" fish are separated from the fresh or good ones.**

Of all the kinds of fish that are cured in pickle, none in its fresh state so quickly deteriorates through careless handling or delay in curing as mackerel. The flesh of a really well-cured mackerel should be white, firm and smooth, and it is easy enough to produce fish of that desirable standard,—provided they are taken from the water in good condition,—by giving careful attention to certain necessary details in the process of curing and packing.

**Mackerel intended for curing in pickle should be absolutely fresh. Immediately after being taken from the water, especially during warm weather, they should be placed in a shed or some such shelter from the sun, and split, washed and salted as quickly as possible. The less time there is allowed to lapse between the catching and the splitting, the more perfect will be the bleeding and consequently the whiter will be the cured fish. The fish should not be allowed to remain at any time in a large heap, because of the effect of the pressure on those at the bottom.**

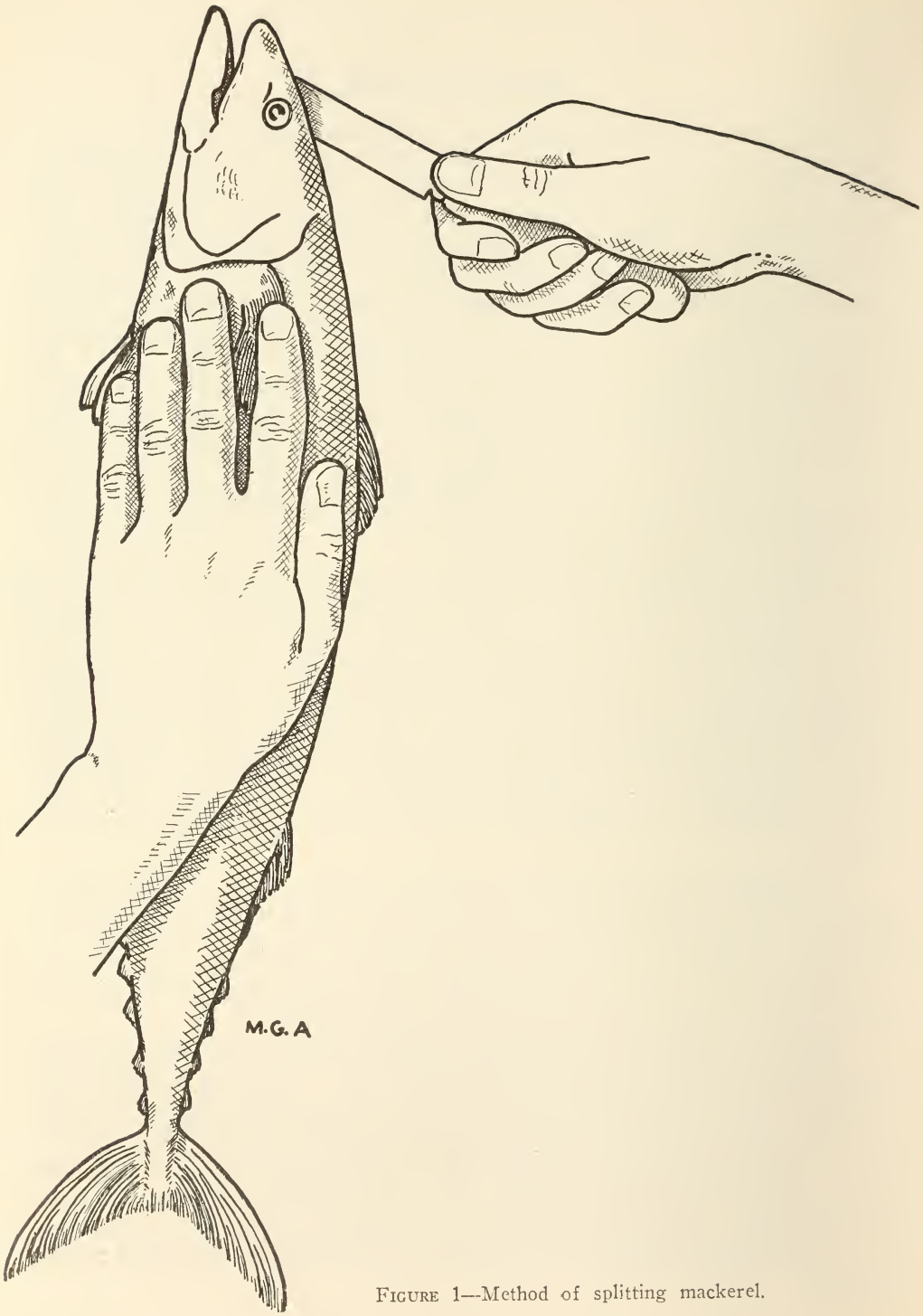


FIGURE 1—Method of splitting mackerel.

## SPLITTING

**The good or bad appearance of the cured mackerel depends to a very great extent on whether it has been split carefully or not.**

To split a mackerel, place it on a table with the tail towards the splitter and the back of the fish towards the splitter's right. Then place the left hand palm down on the upper side of the fish to keep it steady. Insert the knife at the point of the head and split the fish down the back to the tail, cutting on the upper side of the backbone. The method of holding the fish and inserting the knife is shown in figure 1.

The knife should have a blade about three inches in length with a rounded point. The edge should be kept very sharp at all times. If the knife is too long or if the cut is made too deeply the fish will probably be cut completely through from the vent to the tail, causing the appearance known as "swallow tail." This must be avoided. The blade of a knife that is too long may be wrapped with a piece of cotton where the blade joins the handle to shorten the cutting edge.

Examples of properly and improperly split fish are shown in figure 2. The fish shown on the left has been properly split while the one on the right is poorly split. The knife went too deeply in one place, and the backbone has been cut through the centre so that pieces of it show on the lefthand side of the fish. After this cut was made the knife was not kept close enough to the backbone and a "sliver" resulted, which is shown on the right-hand side. Finally, the fish was cut through, producing "swallow tail." A short slit is sometimes made in the thick part on each side of fat fish in order that the fatness or thickness of the fish may be readily seen. This also enables the salt to penetrate and cure the thick parts of the fish as speedily as the thin parts.

## GUTTING

To gut a mackerel, open the fish and spread it back down on a table, with the head pointing towards you. Insert the fingers of the right hand under the guts at about the middle of the fish, turn the wrist and roll the hand over the guts. Place the thumb underneath and push it towards the vent. The thumb will thus scrape along under the guts and remove them from the vent. After clearing from the vent, pull back and the guts will come away from the throat.

To remove the gills, insert the thumb under the gills at the mouth on one side, reach over with the fingers and with a twisting motion towards the centre of the fish, remove the gills. Repeat this to remove the gills from the other side. A knife may be used to assist in removing the guts and gills, but great care should be taken to avoid damaging the fish. **The guts and gills must be entirely removed. Experiments have shown that fish will decompose much more quickly when even small amounts of gut or gill are allowed to remain.**

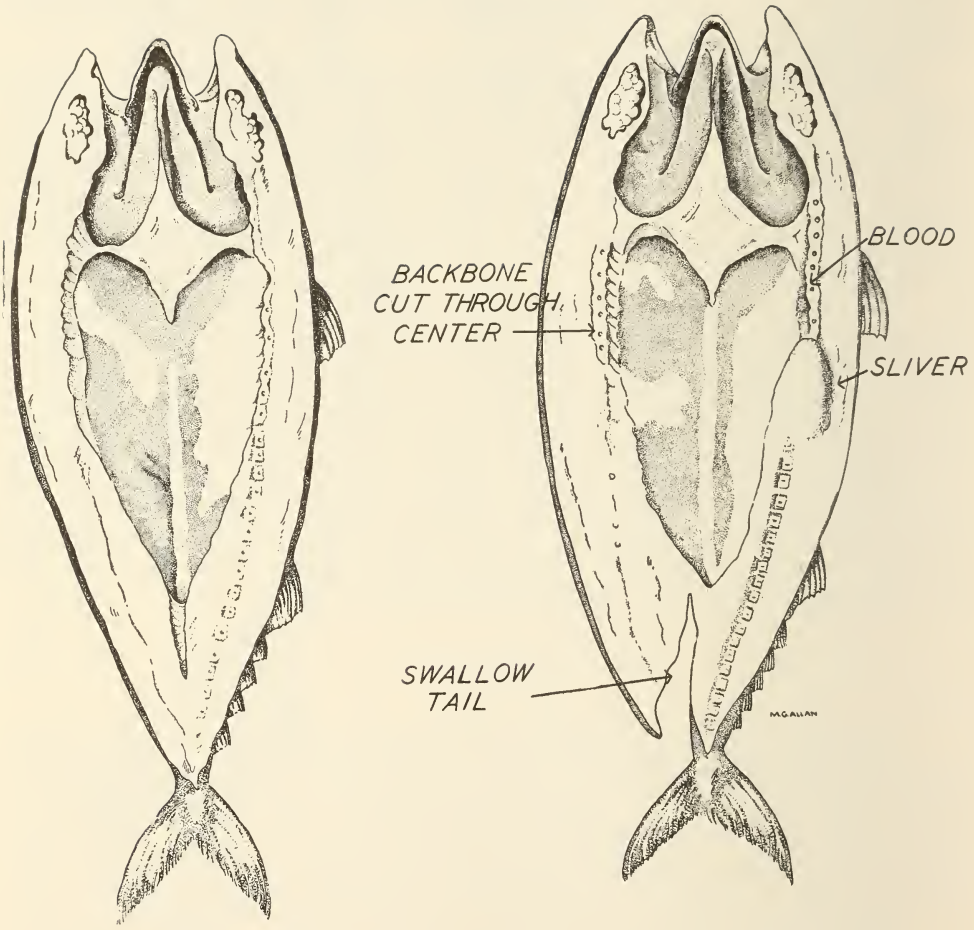


FIGURE 2—(*a*) A properly split mackerel.
(*b*) An improperly split mackerel.

### SCRAPING

The blood should be removed from around the backbone by scraping with a knife—a brush or spoon may also be used. The knife should have a rounded point so that the fish will not be torn. The greater the care that is taken in removing the blood, the better will be the quality. Fish from which all the blood has not been removed are usually unfit for local markets and will not command as high a price as fish which have been properly scraped. The right-hand fish in figure 2 shows a discolored spot on the inside of the backbone on the right side. This spot indicates that all the blood has not been removed.

### WASHING

**The fish should be washed immediately after splitting, in a large tub or other suitable water-tight receptacle. The tub should be partly filled with clean water, to which should be added some clean salt in order to make a weak pickle. The quantity of blood that comes from a split mackerel is so great that the water into which the fish is first thrown becomes discolored and foul very quickly. They should, therefore, not be left in the first water for more than about fifteen minutes. The water should be changed frequently.** If running water is not available, the fish should be washed in three separate waters; each separate water, however, should consist of weak pickle. The fish should be left in the third water for two hours. Less time will be sufficient in the second water.

### CURING

The curing of mackerel takes place by salting in puncheons as a rule. **Fairly fine salt should be used as coarse salt is apt to make impressions in the fish and give them a ragged appearance. To begin the packing, a layer of salt should be evenly spread over the bottom of the puncheon.** The first layer or tier of fish is then placed on top of the layer of salt. The fish should be placed back down. The first fish should be laid with the side containing the backbone against the staves of the puncheon. The second fish and the others should be laid in a similar manner until the circle of the bottom of the puncheon is completed. When the outside row is completed some fish should be placed in the centre so as to make the tier level. If the tiers are not made level the weight of the upper layers will cause an uneven pressure and damage the lower tiers of fish. **After the first tier has been completed, it should be covered with salt; care must be taken to see that every part of every fish is covered by the salt. Where the fish overlap some salt should be sprinkled between them, so that they will not stick together.**

The next tier is packed in the same manner as the first, and so on, until two or three inches from the top of the puncheon. **The top tier should be well covered with salt.**

**As it is of the utmost importance that every part of every fish should come in contact with the salt, it has been found that the best way to**

**ensure this is to use a shallow box partly filled with salt, in which each fish is laid and covered, and then lifted therefrom and packed in puncheons.** Each tier when completed in the puncheons should be sprinkled with salt, but as a considerable amount of salt would be found to stick to each fish when the shallow-box method is used, the tiers in the puncheons would not require so much salt as when the fish are placed in the puncheon without previous salting. Figure 3 shows how a puncheon should be filled with mackerel.

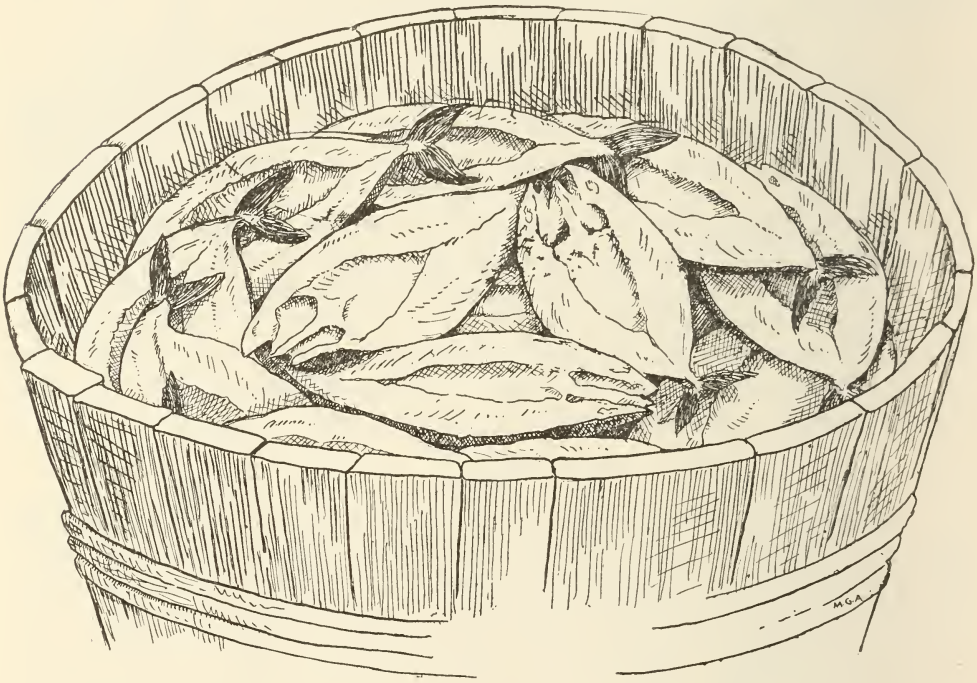

FIGURE 3—Method of filling curing puncheons with split mackerel.

**When the puncheon has been filled with mackerel and properly salted, it should be filled up with brine of 100% strength. Afterwards boards with weights should be placed on top of the fish in the puncheon to prevent them from floating upwards in the pickle and coming in contact with the air. The puncheons should be examined from time to time, and any pickle that may have been lost by evaporation or leakage should be replaced.** The fish should always be covered with brine, because if exposed to the air, they will become rusted owing to the oxydation of the fat. Mackerel which have been properly cured and looked after and always kept covered with brine, will not be rusty. Packers will, of course, understand that large, fat fall mackerel require more salt in curing than thin spring mackerel.

**Care should be taken to see that the puncheons are not kept under a leaky roof or in any place where water might drip on them.** If fresh water, such as rain-water, is allowed to fall upon the fish, it will not mix with the strong brine but will form a layer of weak brine on the top of the puncheon. As a result of this diluted brine the top tiers of fish in the puncheon will not be as well cured as the lower ones.

The regulations of the Fish Inspection Act require that mackerel must remain in the curing puncheons for at least fourteen days.

The spoilage of fish is a process which requires the presence of water. If the water be removed, this process will go on so slowly that the fish may be kept for a considerable time. The use of salt in the curing of fish is, therefore, to remove the water from the cells of the fish muscle by a process known as "osmosis." Water is removed from the muscle when the fish is surrounded by strong brine. At the same time some of the salt enters the cells of the muscle. The brine should be the full 100% in strength. The water which comes from the fish muscle will dilute the brine which, on this account, must be kept up to strength. If the fish are placed in strong brine only, the weak brine which forms will rise to the top of the puncheon and the upper layers will be exposed to such weak brine and will not be properly cured. It is, therefore, better to use dry salt, placing it in contact with every part of every fish, as has been described above, than to use strong brine alone. The dry salt soon dissolves in the water which is on the surface of the fish and forms a layer of strong brine in contact with the fish. This strong brine removes the water and accordingly becomes weaker, but there is sufficient salt present which will dissolve and keep the brine up to strength. If any portion of the fish is in contact with the weak brine, as when the curing receptacles are stored under a leaky roof, the water is insufficiently withdrawn from the muscle and the fish will spoil.

## PACKING

When the fish have been thoroughly cured in the puncheons, they should be removed therefrom. **This should be done by hand or by a small dip-net, in order to prevent the mangling of the fish. The cured fish should then be washed in a tub partly filled with clean brine and afterwards allowed to drain for some time. They should then be selected or graded in accordance with the requirements of the Fish Inspection Act, and weighed in lots in preparation for packing. There should be an excess of five per cent. of the required weight in each lot to allow for shrinkage, that is to say, a lot for a two hundred barrel should be weighed out at two hundred and ten pounds.**

The standard barrel, as prescribed in the regulations to the Fish Inspection Act, should be used. (Any Fishery Officer will supply a packer with a copy of the Act and the regulations on request.) The barrel should be absolutely water-tight. It is advisable, however, to soak or rinse the barrel in clean water before packing the fish, in order to tighten it up.

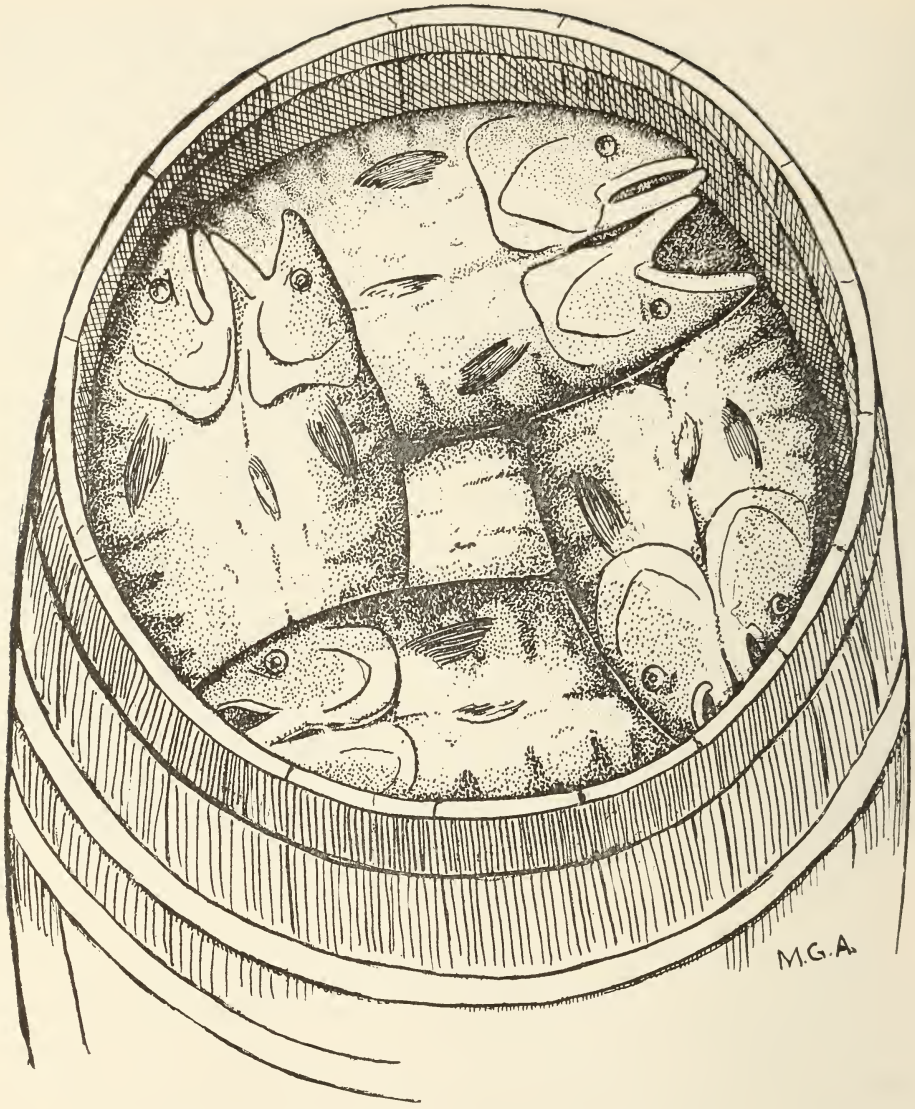


FIGURE 4—Proper method of packing mackerel in barrel.

**In beginning packing, an even layer of salt should be spread on the bottom of the barrel. The first tier of fish should be laid back down in the following manner:**

**Lay the first fish on the salt and place the second one so that its head lies over the tail of the first one and its body at right angles, so that two fish form two sides of a square.** Figure 4 shows how the fish **should be packed in a barrel. Lay the third and fourth fish in a similar way,**

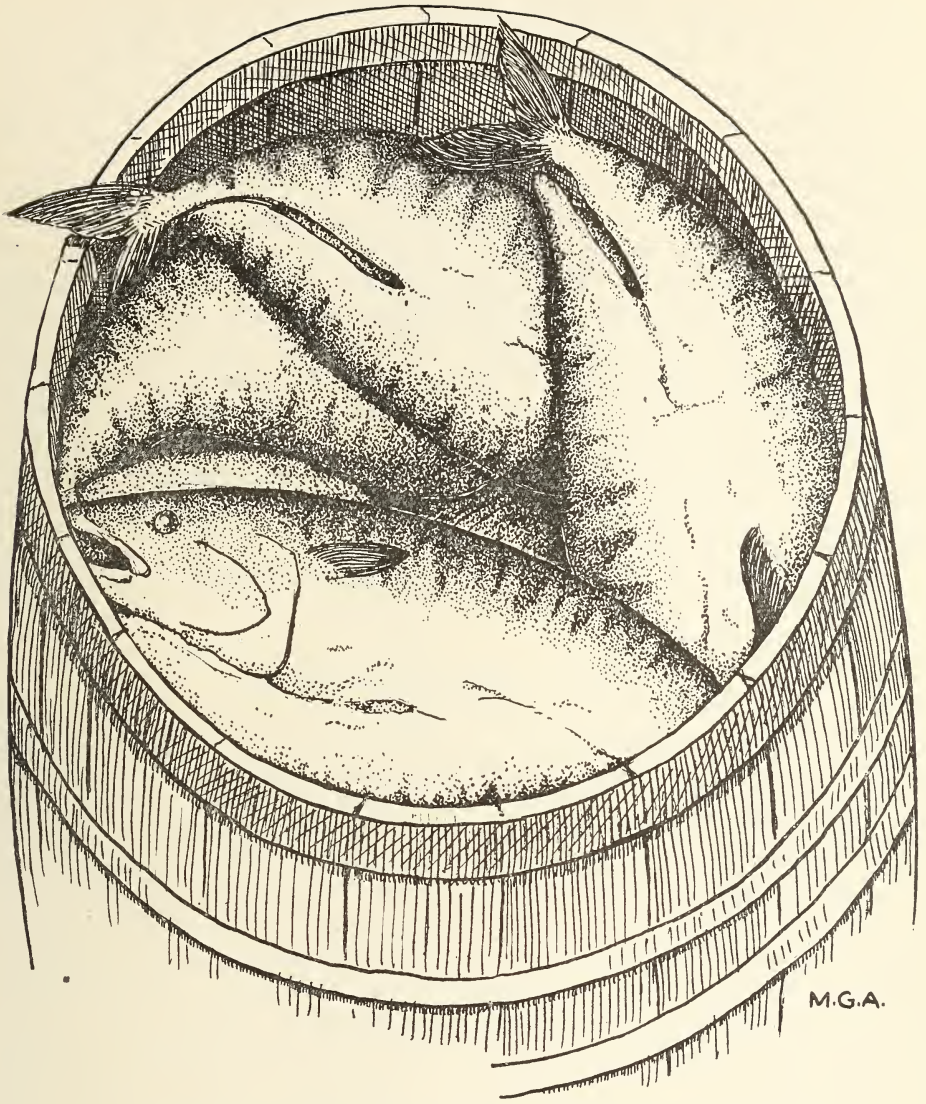


FIGURE 5—Improper method of packing mackerel in barrel.

**so that their heads lie on top of the tails of the others.** The tail of the fourth fish should then be slid under the head of the first, and the four fish will form a square. The side of the fish containing the backbone should be placed next the staves of the barrel. If the fish are very large, lay only three in a tier and arrange them so that they form a triangle, the heads being over the tails in each case. **Spread a layer of salt over the tier when it has been completed, making sure that there is sufficient salt to prevent the fish from sticking**

**to each other. Lay the next tier in a similar manner and continue until within a few inches of the top of the barrel.** The top tier should be placed with the back up. When the bilge of the barrel is reached in packing, there may be some space in the centre of the tier not filled on account of the greater diameter of the barrel. This space should be filled with one or more fish so that the tiers may be kept level. A properly packed barrel is shown in figure 4 and an improperly packed one is shown in figure 5. It will readily be seen how much better a properly packed barrel appears to the buyer.

**When the barrel has been filled, it should be headed up and turned on its side. A bunghole should then be bored in the side of the barrel, care being taken to bore the hole through the centre of one of the staves, and not near the joint of the staves. If the hole is bored too close to the joints, the staves will spread when the bung is hammered in and the barrel will leak. The barrel should then be filled with 100% brine, using a funnel to prevent waste of pickle.** A bung should be then inserted in the bunghole. **If the barrels remain in storage for any considerable time, they should be examined every two weeks to see whether there is still sufficient pickle to completely cover the fish.**

When the barrel is ready for official inspection and shipment, it should be stencilled with the name and address of the packer.

## TO MAKE A SIMPLE SALINOMETER

A salinometer is an instrument by which anyone can determine the exact strength of brine. Such instruments are, of course, on sale, but many fishermen packers may find it difficult to obtain a salinometer in that way. The following, therefore, describes how a simple, inexpensive one can be made by any packer.

It is well-known, of course, that any object will float more easily in a brine than it will in pure water, and the extent to which it will sink will depend upon the strength or weakness of the brine. The salinometer, therefore, is an instrument that will float in brine and from the depth at which it will float, the strength of the brine may easily be read by means of a scale or marks on the instrument. The rough and ready way to estimate the strength of brine is by the use of a potato or a herring, but that obviously is a rather inaccurate method to determine the definite strength of brine. To make a salinometer, therefore, take a piece of good wood about ten or eleven inches in length, two inches wide and about three-quarters of an inch thick. Carve or cut it with a knife until it has the shape shown in figure 6. It will be seen that the salinometer consists of a narrow stem about six or seven inches long with a bulb on the bottom. The narrow stem should be of uniform diameter from top to bottom. The size of the bulb necessary on the bottom should be determined by trial floatings. After the wood has been cut to the necessary shape, a bit of lead or iron should be fastened to the bottom of the bulb, as shown at "C" in figure 6. Its weight acts like a keel and makes the instrument float upright. A large nail or screw may be used as a weight. The weight should be secured to the centre of the

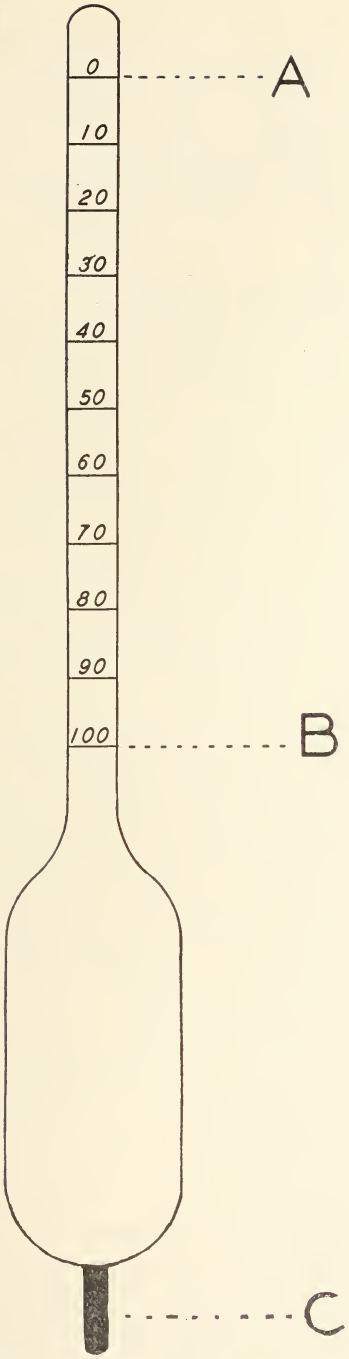


FIGURE 6—Detail of salinometer.

bottom of the bulb so that the instrument will float perfectly upright. If it does not float upright, the weight should be adjusted until it does so, as this is important. The instrument should then be placed in pure fresh water when it will probably be found to sink, as shown in figure seven-A. The wood should then be trimmed or the weight adjusted until the instrument floats upright. When these adjustments have been made, the point on the stem to which the water level comes should be marked with a line and the figure "0," as shown in figure 7.

The instrument should now be placed in a saturated salt solution. To prepare such a solution add salt to boiling water, stir well all the time until no more salt can be made to dissolve, then allow the solution to cool. The excess salt will be deposited on the bottom and the solution will be saturated, that is, it will contain the largest amount of salt that can be dissolved in it. After it has cooled to room temperature, pour it into a vessel tall enough to allow the instrument to be inserted, and place the salinometer in the solution.

It will then be seen that the instrument floats with its stem much farther out of the liquid than it did in pure water. This is shown in figure 7-B. If the salinometer floats so that the level of the brine is at a point such as "B" in figure 6, this point should be marked with a line and the figures "100"; in other words, that point marks the full 100% brine solution. The space between the figure "0" and the figures "100" should then be divided into ten equal parts and each line marked, as shown in figure 6.

If all of the foregoing has been carefully followed, the result will be an extremely inexpensive instrument which will enable anyone to read off the strength of any salt solution by simply placing the instrument in the brine and allowing it to float in it. The point to which the brine level reaches on the scale marked on the salinometer will indicate the strength of the solution in terms of the percentage strength of brine. For example, if the salinometer is placed in brine, the strength of which you wish to know, and if the salinometer sinks to the line marked thirty on the stem, that indicates that the brine has a strength of only thirty per cent. If the salinometer sinks only to the seventy mark the brine is of seventy per cent. strength, and so on.

After the salinometer has been made and tested, it is well for its preservation to give it a good coat of varnish. As this may slightly alter the scale, however, it is advisable to varnish it before the scale is marked, leaving the part of the stem where you intend to mark the scale free of varnish. Allow the varnish to dry, then graduate the instrument first in pure water, then in brine, as above described. Allow the instrument to dry and then varnish the scale.

It is advisable to readjust the instrument from time to time by immersing it in pure water, and then in full-strength brine to see if it is still reading correctly. If it does not read quite correctly after being used for some time, the scale may be slightly adjusted. If it is reading very far off from the scale, however, it has probably become soaked with brine. In that case, it would be far better to make a new one.

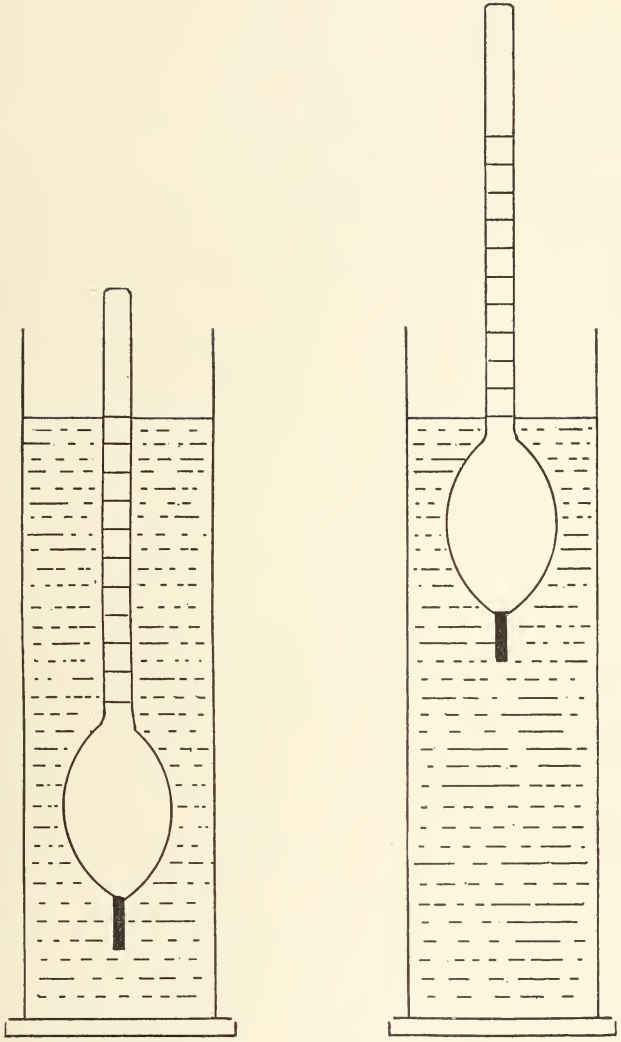


FIGURE 7--(A) Salinometer floating in pure water.
(B) Salinometer floating in saturated salt solution.

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